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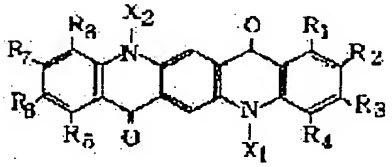
(54) ORGANIC ELECTROLUMINESCENT ELEMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an element having excellent light emitting efficiency and for emitting light at a high luminance by sandwiching at least one layer containing at least one kind of specified compounds between a pair of electrodes.
SOLUTION: This compound is expressed by the formula shown. In the formula, at least one pair of adjacent groups selected from among R1 and R2, R2 and R3, R3 and R4, R5 and R6, R6 and R7, R7 and R8 are connected to each other, and form a substituent or un-substituent carbocyclic aliphatic group ring, a substituent or un-substituent carbocyclic aromatic group ring or substituent or un-substituent heterocyclic aromatic group ring with substituted carbon atom. R1-R8 not forming a ring mean a hydrogen atom, halogen atom, normal chained, branched or cyclic alkyl group or alkoxy group, a substituent or un-substituent aryl group or N,N-di substituent amino group. X1, X2 a hydrogen atom, a normal chained, branched or cyclic alkyl group, a substituent or un- substituent aryl group, or a substituent or un-substituent aralkyl group. At this stage, X1, X2 do not mean a hydrogen atom at the same time.



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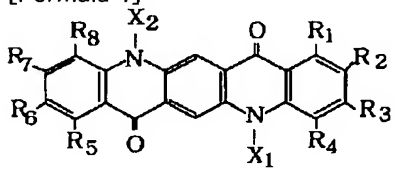
CLAIMS

[Claim(s)]

[Claim 1] Organic electroluminescence devices which come at least to pinch the layer containing at least one sort of compounds expressed with a general formula (1) and (** 1) to inter-electrode [of a pair] further.

[Formula 1]



(1)

With the carbon atom which combined mutually at least 1 set chosen from R1, R2, R2 and R3, R3 and R4, R5 and R6, R6 and R7, and R7 and R8 of adjoining radicals among [type, and has been permuted The ring type aromatic series ring which is not permuted [the ring type aliphatic series ring which is not permuted / a permutation or /, a permutation, or], Or R1 -R8 which forms the heterocycle type aromatic series ring which is not permuted [a permutation or], and does not form a ring Hydrogen atom, Aryl group [which is not permuted / a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching or an annular alkoxy group, a permutation, or] or N, and N-JI permutation amino group is expressed. X1 And X2 The aralkyl radical which is not permuted [the aryl group which is not permuted / a hydrogen atom, a straight chain, branching or an annular alkyl group, a permutation, or /, a permutation, or] is expressed. However, X1 And X2 A hydrogen atom is not expressed to coincidence.]

[Claim 2] Organic electroluminescence devices according to claim 1 whose layer containing the compound expressed with a general formula (1) is a luminous layer.

[Claim 3] Organic electroluminescence devices according to claim 1 whose layer containing the compound expressed with a general formula (1) is an electron injection transportation layer.

[Claim 4] Organic electroluminescence devices according to claim 1 to 3 to which the layer containing the compound expressed with a general formula (1) is further characterized by containing a luminescent organometallic complex.

[Claim 5] Organic electroluminescence devices according to claim 1 to 4 which have a hole-injection transportation layer further in inter-electrode [of a pair].

[Claim 6] Organic electroluminescence devices according to claim 1 to 5 which have an electron injection transportation layer further in inter-electrode [of a pair].

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to organic electroluminescence devices.

[0002]

[Description of the Prior Art] Conventionally, although inorganic electroluminescence devices have been used as the panel mold light sources, such as a back light, in order to make this light emitting device drive, the high tension of an alternating current is required for them. Recently came and the organic electroluminescence devices (an organic electroluminescent element: organic EL device) which used the organic material for luminescent material were developed [Appl.Phys.Lett., 51, and 913 (1987)]. Organic electroluminescence devices are components which emit light using the light which has the structure pinched between an anode plate and cathode in the thin film containing a fluorescence organic compound, injects an electron and an electron hole (hole) into this thin film, and is emitted in case an exciton (exciton) is made to generate and this exciton deactivates by making it recombine. organic electroluminescence devices -- severalV- dozens -- it is the low battery of about V direct current, and luminescence of various colors (for example, red, blue, green) is possible by being able to emit light and choosing the class of fluorescence organic compound. As for the organic electroluminescence devices which have such a description, the application to various light emitting devices, a display device, etc. is expected. However, generally, luminescence brightness is low and is not enough practically.

[0003] As an approach of raising luminescence brightness, the organic electroluminescence devices which used for example, tris (8-quinolate) aluminum as a luminous layer, and used the host compound, the coumarin derivative, and the pyran derivative as a guest compound (dopant) are proposed [J.Appl.Phys., 65, and 3610 (1989)]. Moreover, organic electroluminescence devices were using tris (8-quinolate) aluminum as a luminous layer, and using the host compound and the Quinacridone derivative (for example, Quinacridone) as a guest compound are proposed (JP,3-255190,A). Moreover, organic electroluminescence devices were using tris (8-quinolate) aluminum as a luminous layer, and using a host compound, 5, and 12-dimethyl Quinacridone (N and N'-dimethyl Quinacridone) as a guest compound are proposed [Appl.Phys.Lett., 70, and 1665 (1997)]. However, these light emitting devices are also hard to be referred to as having sufficient luminescence brightness. Moreover, the adhesion of the layer and electrode (for example, cathode) containing Quinacridone and 5, and 12-dimethyl Quinacridone was scarce, and it became clear that the it was improved on the occasion of the prolonged activity. In current, organic electroluminescence devices which emit light in high brightness further are desired.

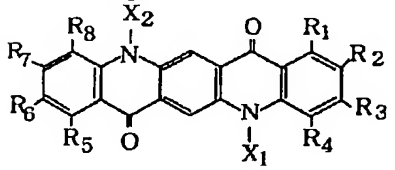
[0004]

[Problem(s) to be Solved by the Invention] The technical problem of this invention is offering the organic electroluminescence devices which are excellent in luminous efficiency and emit light in high brightness.

[0005]

[Means for Solving the Problem] this invention person etc. came to complete this invention, as a result of examining organic electroluminescence devices wholeheartedly. That is, this invention is the organic electroluminescence devices which come at least to pinch the layer containing at least one sort of compounds expressed with a general formula (1) and (** 2) to inter-electrode [of ** couple] further, and [0006].

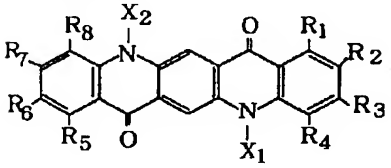
[Formula 2]



(1)

With the carbon atom which combined mutually at least 1 set chosen from R1, R2, R2 and R3, R3 and R4, R5 and R6, R6 and R7, and R7 and R8 of adjoining radicals among [type, and has been permuted The ring type aromatic series ring which is not permuted [the ring type aliphatic series ring which is not permuted / a permutation or /, a permutation, or], Or R1 -R8 which forms the heterocycle type aromatic series ring which is not permuted [a permutation or], and does not form a ring Hydrogen atom, Aryl group [which is not permuted / a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching or an annular alkoxy group, a permutation, or] or N, and N-JI permutation amino group is expressed. X1 And X2 The aralkyl radical which is

not permuted [the aryl group which is not permuted / a hydrogen atom, a straight chain, branching or an annular alkyl group, a permutation, or /, a permutation, or] is expressed. However, X1 And X2 A hydrogen atom is not expressed simultaneously.]
** The organic electroluminescence devices given in ** the given layer containing the compound expressed with a general formula (1) is a luminous layer, ** The organic electroluminescence devices given in ** the given layer containing the compound expressed with a general formula (1) is an electron injection transporting bed, ** Organic electroluminescence devices given in either the aforementioned ** to which the layer containing the compound expressed with a general formula (1) is further characterized by containing a luminescent organometallic complex - **, ** It is further related with inter-electrode [of organic electroluminescence devices given in either the aforementioned ** which has a hole-injection transporting bed - **, and ** couple] at organic electroluminescence devices given in either the aforementioned ** which has an electron injection transporting bed - ** inter-electrode [of a couple].
[0007]
[Embodiment of the Invention] Hereafter, this invention is explained to a detail. The organic electroluminescence devices of this invention come at least to pinch the layer containing at least one sort of compounds expressed with a general formula (1) and (** 3) to inter-electrode [of a couple] further.
[0008]
[Formula 3]



(1)

With the carbon atom which combined mutually at least 1 set chosen from R1, R2, R2 and R3, R3 and R4, R5 and R6, R6 and R7, and R7 and R8 of adjoining radicals among [type, and has been permuted The ring type aromatic series ring which is not permuted [the ring type aliphatic series ring which is not permuted / a permutation or /, a permutation, or], Or R1 -R8 which forms the heterocycle type aromatic series ring which is not permuted [a permutation or], and does not form a ring Hydrogen atom, Aryl group [which is not permuted / a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching or an annular alkoxy group, a permutation, or] or N, and N-JI permutation amino group is expressed. X1 And X2 The aralkyl radical which is not permuted [the aryl group which is not permuted / a hydrogen atom, a straight chain, branching or an annular alkyl group, a permutation, or /, a permutation, or] is expressed. However, X1 And X2 A hydrogen atom is not expressed simultaneously.]
[0009] the compound expressed with a general formula (1) -- setting -- R1 R2 and R2 R3 and R3 R4 and R5 R6 and R6 R7 and R7 R8 At least 1 set chosen of adjoining radicals are combined mutually. from -- With the permuted carbon atom, the ring type aliphatic series ring which is not permuted [a permutation or], The heterocycle type aromatic series ring which is not permuted [the ring type aromatic series ring which is not permuted / a permutation or /, a permutation, or] is formed. Preferably R1 R2 and R2 R3 and R3 R4 and R5 R6 and R6 R7 and R7 R8 from -- at least 1-2 sets chosen of adjoining radicals With the carbon atom which combined each other and has been permuted, the heterocycle type aromatic series ring with 6-16 total carbon which is not permuted [a ring type aromatic series ring with 6-10 total carbon which is not permuted / the ring type aliphatic series ring which is not permuted / a permutation with 5-10 total carbon or /, a permutation, or /, a permutation, or] is formed.
[0010] As an example of a ring type aliphatic series ring, a ring type aromatic series ring, or a heterocycle type aromatic series ring, a cyclopentene ring, a cyclohexene ring, a cyclo heptene ring, a cyclooctane ring, the benzene ring, a naphthalene ring, the Indore ring, N-permutation Indore ring (for example, N-ethyl indole ring, a N-n-butyl indole ring, N-phenylindole ring), etc. can be mentioned, and they are a cyclohexene ring, the benzene ring, and N-permutation Indore ring more preferably, for example. In addition, the ring type aliphatic series ring, the ring type aromatic series ring, or the heterocycle type aromatic series ring may have the substituent. For example, R1 -R8 The quoted halogen atom, the straight chain of carbon numbers 1-16, Branching or an annular alkyl group, the straight chain of carbon numbers 1-16, branching, or an annular alkoxy group, or the aryl group which is not permuted [the permutation of carbon numbers 4-16, or] -- a single permutation -- or you may many permute and they are a non-permuted ring type aliphatic series ring, a non-permuted ring type aromatic series ring, or the nitrogen-containing heterocycle type aromatic series ring of N-permutation more preferably.
[0011] R1 -R8 which does not form a ring in the compound expressed with a general formula (1) Aryl group [which is not permuted / a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching or an annular alkoxy group, a permutation, or] or N, and N-JI permutation amino group is expressed. In addition, an aryl group expresses heterocycle type aromatic series radicals, such as ring type aromatic series radicals, for example, a furil radical, such as a phenyl group and a naphthyl group, a thienyl group, and a pyridyl radical. R1 -R8 which does not form the ring in the compound expressed with a general formula (1) As an example A hydrogen atom, a halogen atom (for example, a fluorine atom, a chlorine atom, a bromine atom), the straight chain of carbon numbers 1-16, branching, or an annular alkyl group (for example, a methyl group --) An ethyl group, n-propyl group, an isopropyl group, n-butyl, an isobutyl radical, sec-butyl, tert-butyl, n-pentyl radical, an isopentyl radical, A neopentyl radical, a tert-pentyl radical, a cyclopentylic group, n-

hexyl group, 3 and 3-dimethyl butyl, a cyclohexyl radical, n-heptyl radical, a cyclohexyl methyl group, n-octyl radical, a tert-octyl radical, a 2-ethylhexyl radical, n-nonyl radical, n-decyl group, n-dodecyl, n-tetradecyl radical, n-hexadecyl radical, etc., the straight chain of carbon numbers 1-16, branching, or an annular alkoxy group (for example, a methoxy group --) An ethoxy radical, n-propoxy group, an isopropoxy group, an n-butoxy radical, An iso butoxy radical, a sec-butoxy radical, an n-pentyloxy radical, a neopentyl oxy-radical, Cyclopenthyloxy radical, n-hexyloxy radical, 3, and 3-dimethyl butyloxy radical, [0012], such as a cyclohexyloxy radical, n-heptyloxy radical, n-octyloxy radical, 2-ethylhexyloxy radical, n-nonyloxy radical, an n-decyloxy radical, n-dodecyloxy radical, n-tetradecyl oxy-radical, and n-hexadecyl oxy-radical Or the aryl group which is not permuted [the permutation of carbon numbers 4-16, or] for example, a phenyl group, 2-methylphenyl radical, and 3-methylphenyl radical -- 4-methylphenyl radical, 4-ethyl phenyl group, a 4-n-propyl phenyl group, 4-isopropyl phenyl group, a 4-n-buthylphenyl radical, a 4-tert-buthylphenyl radical, 4-isopentyl phenyl group, a 4-tert-pentyl phenyl group, A 4-n-hexyl phenyl group, 4-cyclohexyl phenyl group, a 4-n-octyl phenyl group, A 4-n-DESHIRU phenyl group, 2, 3-dimethylphenyl radical, 2, 4-dimethylphenyl radical, 2, 5-dimethylphenyl radical, 3, 4-dimethylphenyl radical, 5-indanyl radical, 1, 2, 3, a 4-tetrahydro-5-naphthyl group, 1, 2 and 3, a 4-tetrahydro-6-naphthyl group, 2-methoxypheny radical, 3-methoxypheny radical, 4-methoxypheny radical, A 3-ethoxy phenyl group, a 4-ethoxy phenyl group, a 4-n-propoxy phenyl group, 4-isopropoxy phenyl group, a 4-n-butoxy phenyl group, a 4-n-pentyloxy phenyl group, A 4-n-hexyloxy phenyl group, 4-cyclohexyloxy phenyl group, A 4-n-heptyloxy phenyl group, a 4-n-octyloxy phenyl group, A 4-n-decyloxy phenyl group, 2, 3-dimethoxy phenyl group, 2, 5-dimethoxy phenyl group, 3, 4-dimethoxy phenyl group, a 2-methoxy-5-methylphenyl radical, A 3-methyl-4-methoxypheny radical, 2-fluoro phenyl group, 3-fluoro phenyl group, 4-fluoro phenyl group, 2-chlorophenyl radical, a 3-chlorophenyl radical, 4-chlorophenyl radical, 4-BUROMO phenyl group, 4-trifluoro methylphenyl radical, 3, 4-dichlorophenyl radical, a 2-methyl-4-chlorophenyl radical, A 2-chloro-4-methylphenyl radical, a 3-chloro-4-methylphenyl radical, A 2-chloro-4-methoxypheny radical, 4-phenyl phenyl group, 3-phenyl phenyl group, 4-(4'-methylphenyl) phenyl group, 4-(4'-methoxypheny) phenyl group, [0013], such as 1-naphthyl group, 2-naphthyl group, a 4-ethoxy-1-naphthyl group, a 6-methoxy-2-naphthyl group, a 7-ethoxy-2-naphthyl group, 2-furil radical, 2-thienyl group, 3-thienyl group, 2-pyridyl radical, 3-pyridyl radical, and 4-pyridyl radical carbon numbers 2-16N and N-JI permutation amino group (for example, N and N-dimethylamino radical --) An N and N-diethylamino radical, N, and N-G n-butylamino radical, N, and N-G n-hexylamino radical, N, such as an N-methyl-N-n-butylamino radical, N-dialkyl permutation amino group, An N-methyl-N-phenylamino radical, an N-ethyl-N-phenylamino radical, N-alkyl-N-phenyl permutation amino groups, such as a N-n-propyl-N-phenylamino radical and a N-n-butyl-N-phenylamino radical, They are N, such as N and N-diphenylamino radical and an N-phenyl-N-(4-methylphenyl) amino group, an N-diaryl permutation amino group, etc. more preferably A hydrogen atom, a fluorine atom, a chlorine atom, the alkyl group of carbon numbers 1-10, the alkoxy group of carbon numbers 1-10, It is the aryl group of carbon numbers 6-10 or carbon numbers 6-16N, and N-JI permutation amino group, and they are a hydrogen atom, a fluorine atom, a chlorine atom, the alkyl group of carbon numbers 1-6, the alkoxy group of carbon numbers 1-6 or carbon numbers 7-16N, and N-JI permutation amino group still more preferably. R1 -R8 which does not form the ring especially It is desirable that it is a hydrogen atom.

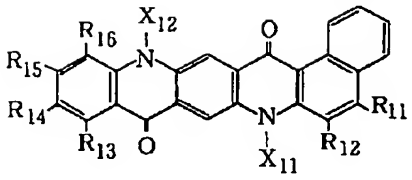
[0014] It sets to the compound expressed with a general formula (1), and is X1. And X2 The aralkyl radical which is not permuted [the aryl group which is not permuted / a hydrogen atom, a straight chain, branching or an annular alkyl group, a permutation, or /, a permutation, or] is expressed. However, X1 And X2 A hydrogen atom is not expressed simultaneously. Preferably A hydrogen atom, the straight chain of carbon numbers 1-16, branching, or an annular alkyl group, They are a ring type aromatic series radical with 6-16 total carbon, a heterocycle type aromatic series radical with 4-16 total carbon, or an aralkyl radical with 7-16 total carbon. More preferably A hydrogen atom, the straight chain of carbon numbers 1-10, branching or an annular alkyl group, a ring type aromatic series radical with 6-10 total carbon, They are a heterocycle type aromatic series radical with 4-10 total carbon, or an aralkyl radical with 7-10 total carbon. Still more preferably They are a hydrogen atom, the straight chain of carbon numbers 1-10, branching or an annular alkyl group, a ring type aromatic series radical with 6-10 total carbon, or an aralkyl radical with 7-10 total carbon.

[0015] X1 And X2 As an example of the aryl group which is not permuted [a straight chain, branching or an annular alkyl group, a permutation, or], it is R1 -R8, for example. The aryl group which is not permuted [branching mentioned as an example or an annular alkyl group, a permutation, or] can be illustrated. Moreover, X1 And X2 As an example of the aralkyl radical which is not permuted [a permutation or] For example, benzyl, phenethyl radical, alpha-methylbenzyl radical, alpha, and alpha-dimethylbenzyl radical, 1-naphthyl methyl group, 2-naphthyl methyl group, a furfuryl radical, 2-methylbenzyl radical, 3-methylbenzyl radical, 4-methylbenzyl radical, 4-ethyl benzyl, 4-isopropyl benzyl, 4-tert-butyl benzyl, 4-n-hexyl benzyl, 3, 4-dimethylbenzyl radical, 3-methoxybenzyl radical, 4-methoxybenzyl radical, Although 4-ethoxybenzyl radical, 4-n-butoxy benzyl, 4-fluoro benzyl, 3-fluoro benzyl, 2-chloro benzyl, 4-chloro benzyl, etc. can be mentioned, it is not limited to these.

[0016] As a compound expressed with the general formula (1) concerning this invention, the compound expressed with a general formula (1-A) - a general formula (1-G) (** 4 --izing 10) can be mentioned as a more desirable compound.

[0017]

[Formula 4]

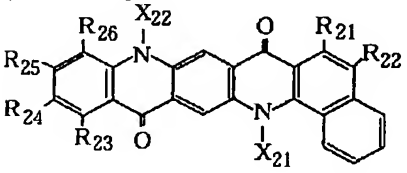


(1 − A)

R11-R16 express among [type the aryl group which is not permuted [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group a straight chain, branching, an annular alkoxy group, a permutation, or], and X11 and X12 express the aralkyl radical which is not permuted [the aryl group which is not permuted / a hydrogen atom, a straight chain, branching or an annular alkyl group, a permutation, or /, a permutation, or]. However, X11 and X12 do not express a hydrogen atom simultaneously.]

[0018]

[Formula 5]

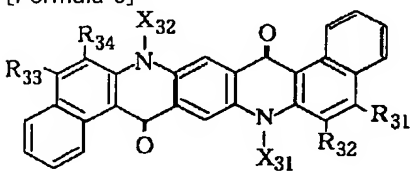


(1 − B)

R21-R26 express among [type the aryl group which is not permuted [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group a straight chain, branching, an annular alkoxy group, a permutation, or], and X21 and X22 express the aralkyl radical which is not permuted [the aryl group which is not permuted / a hydrogen atom, a straight chain, branching or an annular alkyl group, a permutation, or /, a permutation, or]. However, X21 and X22 do not express a hydrogen atom simultaneously.]

[0019]

[Formula 6]

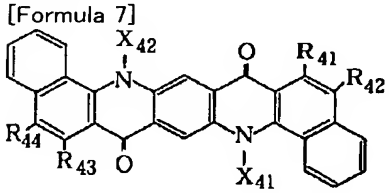


(1 − C)

R31-R34 express among [type the aryl group which is not permuted [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group a straight chain, branching, an annular alkoxy group, a permutation, or], and X31 and X32 express the aralkyl radical which is not permuted [the aryl group which is not permuted / a hydrogen atom, a straight chain, branching or an annular alkyl group, a permutation, or /, a permutation, or]. However, X31 and X32 do not express a hydrogen atom simultaneously.]

[0020]

[Formula 7]

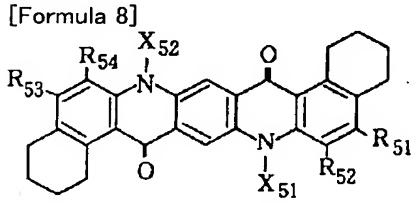


(1 − D)

R41-R44 express among [type the aryl group which is not permuted [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group a straight chain, branching, an annular alkoxy group, a permutation, or], and X41 and X42 express the aralkyl radical which is not permuted [the aryl group which is not permuted / a hydrogen atom, a straight chain, branching or an annular alkyl group, a permutation, or /, a permutation, or]. However, X41 and X42 do not express a hydrogen atom simultaneously.]

[0021]

[Formula 8]



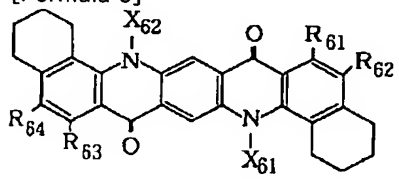
(1 − E)

R51-R54 express among [type the aryl group which is not permuted [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group a straight chain, branching, an annular alkoxy group, a permutation, or], and X51 and X52 express the aralkyl radical which is not permuted [the aryl group which is

not permuted / a hydrogen atom, a straight chain, branching or an annular alkyl group, a permutation, or /, a permutation, or]. However, X51 and X52 do not express a hydrogen atom simultaneously.]

[0022]

[Formula 9]

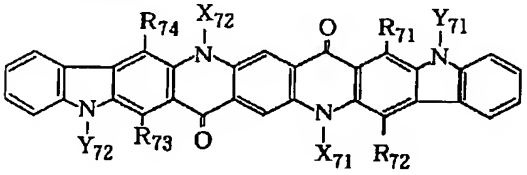


(1 − F)

R61–R64 express among [type the aryl group which is not permuted [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group a straight chain, branching, an annular alkoxy group, a permutation, or], and X61 and X62 express the aralkyl radical which is not permuted [the aryl group which is not permuted / a hydrogen atom, a straight chain, branching or an annular alkyl group, a permutation, or /, a permutation, or]. However, X61 and X62 do not express a hydrogen atom simultaneously.]

[0023]

[Formula 10]



(1 − G)

R71–R74 among [type A hydrogen atom, a halogen atom, a straight chain, branching, or an annular alkyl group, The aryl group which is not permuted [a straight chain, branching, an annular alkoxy group, a permutation, or] is expressed. X71 and X72 express the aralkyl radical which is not permuted [the aryl group which is not permuted / a hydrogen atom, a straight chain, branching or an annular alkyl group, a permutation, or /, a permutation, or], and Y71 and Y72 express the aryl group which is not permuted [a straight chain, branching, an annular alkyl group, a permutation, or]. However, X71 and X72 do not express a hydrogen atom simultaneously.]

[0024] In the compound expressed with a general formula (1–A), R11–R16 are hydrogen atoms more preferably. X11 and X12 are a hydrogen atom, the straight chain of carbon numbers 1–6, branching or an annular alkyl group, a ring type aromatic series radical with 6–10 total carbon, or an aralkyl radical with 7–10 total carbon more preferably.

[0025] In the compound expressed with a general formula (1–B), R21–R26 are hydrogen atoms more preferably. X21 and X22 are a hydrogen atom, the straight chain of carbon numbers 1–6, branching or an annular alkyl group, a ring type aromatic series radical with 6–10 total carbon, or an aralkyl radical with 7–10 total carbon more preferably.

[0026] In the compound expressed with a general formula (1–C), R31–R34 are hydrogen atoms more preferably. X31 and X32 are a hydrogen atom, the straight chain of carbon numbers 1–6, branching or an annular alkyl group, a ring type aromatic series radical with 6–10 total carbon, or an aralkyl radical with 7–10 total carbon more preferably.

[0027] In the compound expressed with a general formula (1–D), R41–R44 are hydrogen atoms more preferably. X41 and X42 are a hydrogen atom, the straight chain of carbon numbers 1–6, branching or an annular alkyl group, a ring type aromatic series radical with 6–10 total carbon, or an aralkyl radical with 7–10 total carbon more preferably.

[0028] In the compound expressed with a general formula (1–E), R51–R54 are hydrogen atoms more preferably. X51 and X52 are a hydrogen atom, the straight chain of carbon numbers 1–6, branching or an annular alkyl group, a ring type aromatic series radical with 6–10 total carbon, or an aralkyl radical with 7–10 total carbon more preferably.

[0029] In the compound expressed with a general formula (1–F), R61–R64 are hydrogen atoms more preferably. X61 and X62 are a hydrogen atom, the straight chain of carbon numbers 1–6, branching or an annular alkyl group, a ring type aromatic series radical with 6–10 total carbon, or an aralkyl radical with 7–10 total carbon more preferably.

[0030] In the compound expressed with a general formula (1–G), R71–R74 are hydrogen atoms more preferably. X71 and X72 are a hydrogen atom, the straight chain of carbon numbers 1–6, branching or an annular alkyl group, a ring type aromatic series radical with 6–10 total carbon, or an aralkyl radical with 7–10 total carbon more preferably. More preferably, it is the straight chain of carbon numbers 1–8, branching or an annular alkyl group, and a ring type aromatic series radical with 6–10 total carbon, and still more preferably, Y71 and Y72 are the straight chain of carbon numbers 1–8 or the alkyl group of branching, and a ring type aromatic series radical with 6–10 total carbon, and are the straight chain of carbon numbers 1–8, or the alkyl group of branching especially preferably.

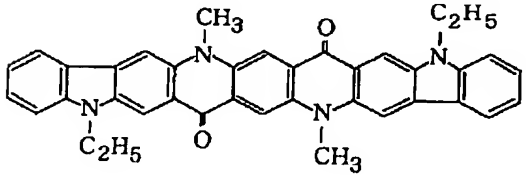
[0031] In the organic electroluminescence devices of this invention, it sets to a general formula (1), and is R1. R2, R2 R3 and R3 R4 and R5 R6 and R6 R7 and R7 R8 from -- at least 1 set chosen of adjoining radicals with

the carbon atom which combined each other and has been permuted The ring type aromatic series ring which is not permuted [the ring type aliphatic series ring which is not permuted / a permutation or /, a permutation, or], Or the heterocycle type aromatic series ring which is not permuted [a permutation or] is formed, and it is X1. And X2 It is the big description to use at least one sort of compounds which do not express a hydrogen atom simultaneously, and it becomes possible [offering the organic electroluminescence devices which emit light in high brightness by this]. Although a reason is not certain, according to the effectiveness of the substituent, the state of aggregation of the Quinacridone derivative can change and, thereby, non-permuted Quinacridone and its derivative (for example, 5, 12-dimethyl Quinacridone), and the Quinacridone derivative expressed with the general formula (1) concerning this invention can be conjectured to be because [that electrical characteristics etc. change] physical.

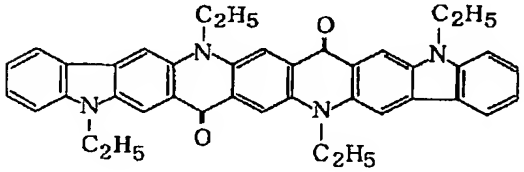
[0032] As an example of a compound expressed with the general formula (1) concerning this invention, although the following compounds can be mentioned, this invention is not limited to these, for example. In addition, naming of a compound expressed with a general formula (1) followed the approach given in for example, Chem.Rev., 67, and 1 (1967).

- Instantiation compound Number

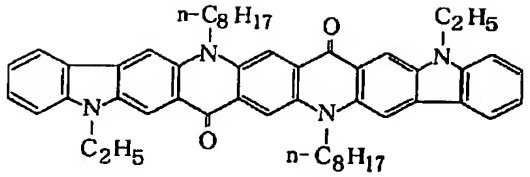
1. 5-Methyl-1:2-Benzo Quinacridone 2. 5, 12-dimethyl-1:2-benzo Quinacridone 3. 5 and 12-diethyl-9-chloro-1:2-benzo Quinacridone 4. 5, 12-dimethyl-3:4-benzo Quinacridone 5. 5 and 12-di-n-butyl-3:4-benzo Quinacridone 6. The 5-methyl -1:2 and 8:9-dibenzo Quinacridone 7. 5, the 12-dimethyl -1:2, and 8:9-dibenzo Quinacridone 8. 5-methyl-12-ethyl -1:2 and 8:9-dibenzo Quinacridone 9. 5, the 12-diethyl -1:2, and 8:9-dibenzo Quinacridone 10. 5, the 12-diisopropyl -1:2, and 8:9-dibenzo Quinacridone 11. 5, 12-di-n-butyl -1:2, and 8:9-dibenzo Quinacridone 12. 5, the 12-G n-pentyl -3, 10-diphenyl -1:2, 8: 9-dibenzo Quinacridone 13. 5, the 12-G n-hexyl -1:2, 8:9-dibenzo chinae-cortex KURIDO N 14. The 5-phenyl -1:2 and 8:9-dibenzo Quinacridone 15. 5, 12-diphenyl -1:2, and 8:9-dibenzo Quinacridone 16. 5, the 12-dibenzyl -1:2, and 8:9-dibenzo Quinacridone 17. 5, the 12-dimethyl -2:3, and 9:10-dibenzo Quinacridone 18. 5, the 12-dimethyl -3:4, and 10:11-dibenzo Quinacridone 19. 5, the 12-diethyl -3:4, and 10:11-dibenzo Quinacridone 20. 5, the 12-G n-propyl -3:4, 10:11-dibenzo KINAKU RIDON 21. 5, 12-diisobutyl - 3:4, 10:11-dibenzo chinae-cortex KURIDO N 22. 5, the 12-G n-octyl -3:4, 10:11-dibenzo KINAKU RIDON 23. 5, the 12-G n-dodecyl -3:4, 10:11-dibenzo KINAKU RIDON 24. 5, 12-diphenyl -3:4, 10:11-dibenzo Quinacridone 25. 5, 12-JI (4'-methylphenyl) -3:4, 10:11-JIBE NZOKINA chestnut boss 26. The 5-benzyl -3:4, 10:11-dibenzo Quinacridone 27. 5, the 12-dibenzyl -3:4, 10:11-dibenzo Quinacridone 28. 5, 12-JI (4'-methylbenzyl) -3:4, 10:11-JIBE NZOKINA chestnut boss 29. 5, the 12-dimethyl -1:2, 8:9-JINAFUTO Quinacridone 30. 5, the 12-diethyl -3:4, 10:11-JINAFUTO Quinacridone [0033]
31. 5, 12-Dimethyl -1:2, 8:9-Screw (Tetramethylen) Chinae Cortex Chestnut boss 32. 5, the 12-diethyl -1:2, a 8:9-screw (tetramethylen) chinae cortex Chestnut boss 33. 5, 12-diphenyl -1:2, 8:9-screw (tetramethylen) KI NAKURIDON 34. 5, the 12-dimethyl -3:4, 10:11-screw (trimethylene) KI NAKURIDON 35. 5, 12-dicyclohexyl -3:4, 10:11-screw (TORIMECHI Wren) Quinacridone 36. 5, the 12-dibenzyl -3:4, 10:11-screw (trimethylene) Quinacridone 37. 5, the 12-dimethyl -3:4, 10:11-screw (tetramethylen)
Quinacridone 38. 5, the 12-diethyl -3:4, 10:11-screw (tetramethylen)
Quinacridone 39. 5, 12-di-n-butyl -3:4, 10:11-screw () [TETORAMECHI] Wren Quinacridone 40. 5, 12-diphenyl -3:4, 10:11-screw () [tetramethylen] Quinacridone 41. 5, the 12-dibenzyl -3:4, 10:11-screw () [tetramethylen] Quinacridone 42. 5, the 12-diethyl -1:2, 8:9-screw (pentamethylene) chinae cortex Chestnut boss 43. 5, the 12-dimethyl -3:4, 10:11-screw (hexamethylene)
Quinacridone [0034] Furthermore, the following type (44) - a formula (47) (** 11 --izing 14)
44.
[0035]
[Formula 11]



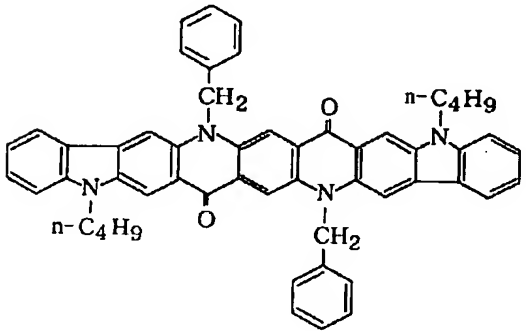
45.
[0036]
[Formula 12]



46.
[0037]
[Formula 13]



47.
[0038]
[Formula 14]



[0039] The compound expressed with the general formula (1) concerning this invention can be itself manufactured according to a well-known approach. For example, according to the approach of a publication, it can manufacture in the reference quoted by Chem.Rev., 67, 1, and (1967) its total theory as a total theory. Namely, for example, the sodium of 2 and 5-JI (ANIRINO permutation which has the condensed ring) terephthalic-acid derivative After manufacturing the Quinacridone derivative heating and by carrying out a ring closure under existence of polyphosphoric acid, Under existence of a base (for example, sodium hydride, a sodium METOKI side, potassium-tert-butoxide, potassium carbonate, a sodium hydroxide) X1 A-izing agent and/or X2 It can manufacture by making a-izing agent (for example, [the halogenide of X1 and/or the halogenide of X2]) act.

[0040] Organic electroluminescence devices usually come at least to pinch the luminous layer which contains at least one sort of luminescence components in inter-electrode [of a couple] further. In consideration of each functional level of the hole injection of the compound used for a luminous layer and electron hole transport, electron injection, and electronic transport, the electron injection transporting bed containing the hole-injection transporting bed and/or electron injection transport component containing a hole-injection transport component can also be prepared according to a request. For example, when the hole-injection function of the compound used for a luminous layer, an electron hole transport function and/or an electron injection function, and an electronic transport function are good, a luminous layer can consider as the configuration of the component of the mold which served both as the hole-injection transporting bed and/or the electron injection transporting bed. Of course, it can also consider as the configuration of the component (much more component of a mold) of the mold which does not prepare the layer of both a hole-injection transporting bed and an electron injection transporting bed depending on the case. Moreover, each layer of a hole-injection transporting bed, an electron injection transporting bed, and a luminous layer may be structure much more, or may be multilayer structure, and in each layer, a hole-injection transporting bed and an electron injection transporting bed can prepare independently the layer which has an impregnation function, and the layer which has a transport function, and can also constitute it.

[0041] In the organic electroluminescence devices of this invention, as for the compound expressed with a general formula (1), it is desirable to use for a hole-injection transport component, a luminescence component, or an electron injection transport component, and it is more desirable to use for a luminescence component or an electron injection transport component. In the organic electroluminescence devices of this invention, the compound expressed with a general formula (1) may be used independently, or may be used together. [two or more]

[0042] Especially as a configuration of the organic electroluminescence devices of this invention, it cannot limit and (A) anode plate / hole-injection transporting bed / luminous layer / electron injection transporting bed / cathode mold component (drawing 1), (B) anode plate / hole-injection transporting bed / luminous layer / cathode mold component (drawing 2), (C) anode plate / luminous layer / electron injection transporting bed / cathode mold component (drawing 3), (D) anode plate / luminous layer / cathode mold component (drawing 4), etc. can be mentioned. Furthermore, it can also consider as (E) anode plate / hole-injection transporting bed / electron injection transporting bed / luminous layer / electron injection transporting bed / cathode mold component (drawing 5) which is a component of the mold which put the luminous layer by the electron injection transporting bed. (D) Although the component of the mold which made inter-electrode [of a couple] pinch a luminescence component with a gestalt further is natural as a component configuration of a mold Furthermore, for example, the component of the mold which it made inter-electrode [of a couple] pinch with the one-layer gestalt which mixed (F) hole-injection transport component, the luminescence component, and the electron

injection transport component (drawing 6), (G) There is a component (drawing 8) of the mold which it made inter-electrode [of a couple] pinch with the one-layer gestalt which mixed the component (drawing 7) or (H) luminescence component, and the electron injection transport component of the mold which it made inter-electrode [of a couple] pinch with the one-layer gestalt which mixed the hole-injection transport component and the luminescence component.

[0043] The organic electroluminescence devices of this invention cannot be restricted to these component configurations, and can prepare a hole-injection transporting bed, a luminous layer, and a two or more layers electron injection transporting bed in each type of component. Moreover, in each type of component, the mixing layer of a luminescence component and an electron injection transport component can also be prepared between a hole-injection transporting bed and a luminous layer between the mixing layer of a hole-injection transport component and a luminescence component and/or a luminous layer, and an electron injection transporting bed. The configuration of more desirable organic electroluminescence devices is (A) mold component, (B) mold component, (C) mold component, (E) mold component, (F) mold component, (G) mold component, or (H) mold component, and is (A) mold component, (B) mold component, (C) mold component, (F) mold component, or (H) mold component still more preferably.

[0044] As organic electroluminescence devices of this invention, (A) anode plate / hole-injection transporting bed / luminous layer / electron injection transporting bed / cathode mold component shown in (drawing 1) are explained, for example. (drawing 1) -- setting -- 1 -- a substrate and 2 -- in an anode plate and 3, an electron injection transporting bed and 6 show cathode, and, as for a hole-injection transporting bed and 4, 7 shows a power source, as for a luminous layer and 5.

[0045] Being supported by the substrate 1 is desirable, especially as a substrate, although the organic electroluminescence devices of this invention are not limited, transparence thru/or a translucent thing are desirable [electroluminescence devices], for example, they can mention what consists of a compound sheet which combined a glass plate, a transparence plastic sheet (for example, sheets, such as polyester, a polycarbonate, polysulfone, polymethylmethacrylate, polypropylene, and polyethylene), a translucent plastic sheet, a quartz, transparent ceramics, or these. Furthermore, the luminescent color is also controllable to a substrate combining for example, the light filter film, the color conversion film, and the dielectric reflective film.

[0046] As an anode plate 2, it is desirable to use a metal with a comparatively large work function, an alloy, or an electric conductivity compound as electrode material. As electrode material used for an anode plate, gold, platinum, silver, copper, cobalt, nickel, palladium, vanadium, a tungsten, tin oxide, a zinc oxide, ITO (indium Tin oxide), the poly thiophene, polypyrrole, etc. can be mentioned, for example. Such electrode material may be used independently or may be used together. [two or more] An anode plate can form such electrode material on a substrate by approaches, such as vacuum deposition and the sputtering method. Moreover, an anode plate may be structure much more, or may be multilayer structure. The sheet electric resistance of an anode plate is more preferably set as 5-50ohms / ** extent below hundreds of ohms / **. Although the thickness of an anode plate is based also on the ingredient of the electrode material to be used, generally it is more preferably set as about 10-500nm about 5-1000nm.

[0047] The hole-injection transporting bed 3 is a layer containing the compound which has the function to convey the electron hole which makes easy impregnation of the electron hole (hole) from an anode plate, and which was functioned and poured in. At least one sort of hole-injection transporting beds can be formed using the compounds (for example, a phthalocyanine derivative, a thoria reel methane derivative, a thoria reel amine derivative, an oxazole derivative, a hydrazone derivative, a stilbene derivative, a pyrazoline derivative, a polysilane derivative, polyphenylene vinylene and its derivative, the poly thiophene and its derivative, a Polly N-vinylcarbazole derivative, etc.) which have the compound and/or other hole-injection transport functions in which it is expressed with a general formula (1). In addition, the compound which has a hole-injection transport function may be used independently, or may be used together. [two or more]

[0048] As a compound which has other hole-injection transport functions to use in this invention a thoria reel amine derivative (for example, 4 and 4' screw [-] [N-phenyl-N-(4"-methylphenyl) amino] biphenyl --) 4 and 4' screw [-] [N-phenyl-N-(3"-methylphenyl) amino] biphenyl, 4 and 4' screw [-] [N-phenyl-N-(3"-methoxypheny) amino] biphenyl, 4 and 4' screw [-] [N-phenyl-N-(1"-naphthyl) amino] biphenyl, 3 and 3' -- the - dimethyl -4 and 4' - screw [N-phenyl-N-(3"-methylphenyl) amino] biphenyl -- 1 and 1-screw [4'-[N and N-JI (4"-methylphenyl) amino] phenyl] cyclohexane, 9, 10-screw [N-(4'-methylphenyl)-N-(4"-n-buthylphenyl) amino] phenanthrene, 3, 8-screw (N and N-diphenylamino)-6-phenyl phenanthridine, four - methyl - N -- N - a screw - - [-- four -- " -- four -- " -- ' - a screw -- [-- N -- ' -- N -- ' - JI (4-methylphenyl) -- amino --] -- a biphenyl - four - IRU --] -- an aniline -- N, N'-screw [4-(diphenylamino) phenyl]-N, N'-diphenyl -1, 3-diaminobenzene, N, N'-screw [4-(diphenylamino) phenyl]-N, N'-diphenyl -1, 4-diaminobenzene, 5 and 5 "- screw [4-(screw [4-methylphenyl] amino) phenyl]-2, 2':5', 2"-TACHIOFEN, 1, 3, 5-tris (diphenylamino) benzene, 4, 4', a 4"-tris (N-carbazolyl) triphenylamine, 4, 4', a 4"-tris [N-(3"'-methylphenyl)-N-phenylamino] triphenylamine, The poly thiophene and its derivatives, such as 1, 3, and 5-tris [N-(4'-diphenyl aminophenyl) phenylamino] benzene, and a Polly N-vinylcarbazole derivative are more desirable. When using together the compound expressed with a general formula (1), and the compound which has other hole-injection transport functions, the rate of a compound of being expressed with the general formula (1) occupied in a hole-injection transporting bed is preferably prepared to about 0.1 - 40% of the weight.

[0049] A luminous layer 4 is a layer containing the compound which has an electron hole and electronic impregnation functions, those transport functions, and the function to make recombination of an electron hole

and an electron generate an exciton. the fluorescence compound (for example, an acridone derivative, the Quinacridone derivative, and a polynuclear aromatic compound -- [-- for example) which has the compound and/or other luminescence functions in which a luminous layer is expressed with a general formula (1) Rubrene, an anthracene, tetracene, a pyrene, perylene, a chrysene, Deca cyclene, coronene, a tetra-phenyl cyclopentadiene, a PENTA phenyl cyclopentadiene, 9, 10-diphenyl anthracene, 9, 10-screw (phenyl ethynyl) anthracene, 1, 4-screw (9'-ethynyl anthracenyl) benzene, 4, and 4'-screw (9"-ethynyl anthracenyl) biphenyl] and a thoria reel amine derivative -- [-- for example] which can mention the compound mentioned above as a compound which has a hole-injection transport function, and an organometallic complex -- [-- for example Tris (8-quinolate) aluminum, screw (10-benzo [h] quinolate) beryllium, the zinc salt of 2-(2'-hydroxyphenyl) benzo oxazole, the zinc salt of 2-(2'-hydroxyphenyl) benzothiazole, zinc salt [of a 4-hydroxy acridine]], and a stilbene derivative -- [-- for example 1, 1, 4, and 4-tetra-phenyl-1,3-butadiene, 4, and 4'-screw (2 and 2-diphenyl vinyl) biphenyl] and a coumarin derivative -- [-- for example A coumarin 1, a coumarin 6, a coumarin 7, a coumarin 30, a coumarin 106, a coumarin 138, a coumarin 151, a coumarin 152, a coumarin 153, a coumarin 307, a coumarin 311, a coumarin 314, a coumarin 334, a coumarin 338, a coumarin 343, coumarin 500], a pyran derivative ([DCM1, DCM2]), and oxazone derivative -- [-- for example, [for example,] Nile red], a benzothiazole derivative, a benzo oxazole derivative, A benzimidazole derivative, a pyrazine derivative, a cinnamate derivative, Polly N-vinylcarbazole and its derivative, the poly thiophene, and its derivative, Polyphenylene and its derivative, the poly fluorene, and its derivative, Polyphenylene vinylene and its derivative, poly biphenylene vinylene, and its derivative, At least one sort can be formed using poly terphenylene vinylene and its derivative, poly naphthylene vinylene and its derivative, poly thienylene vinylene, its derivative, etc.

[0050] In the organic electroluminescence devices of this invention, it is desirable to contain the compound expressed with a general formula (1) to a luminous layer. When using together the compound expressed with a general formula (1), and the compound which has other luminescence functions, the rate of a compound of being expressed with the general formula (1) occupied in a luminous layer is more preferably prepared to about 0.1 - 99.9% of the weight still more preferably about 0.01 to 99.99% of the weight about 0.001 to 99.999% of the weight.

[0051] As a compound which has other luminescence functions to use in this invention, a luminescent organometallic complex is more desirable. For example, a host compound and a guest compound (dopant) can also constitute a luminous layer like a publication in J.Appl.Phys., 65, 3610 (1989), and JP,5-214332,A. A luminous layer can be formed using the compound expressed with a general formula (1) as a host compound, further, it can use as a guest compound and a luminous layer can also be formed. When forming a luminous layer, using the compound expressed with a general formula (1) as a guest compound, as a host compound, a luminescent organometallic complex is desirable. In this case, to a luminescent organometallic complex, the compound expressed with a general formula (1) is twisted, and is used especially about 0.1 to 10% of the weight about 0.01 to 30% of the weight about 0.001 to 40% of the weight preferably.

[0052] Especially as a luminescent organometallic complex used together with the compound expressed with a general formula (1), although it does not limit, a luminescent organic aluminum complex is desirable and the luminescent organic aluminum complex which has 8-quinolate ligand which is not permuted [a permutation or] is more desirable. As a luminescent desirable organometallic complex, the luminescent organic aluminum complex expressed with a general formula (a) - a general formula (c) can be mentioned, for example.

(Q)3 -Al (a)

(Q expresses among a formula 8-quinolate ligand which is not permuted [a permutation or])

(Q)2 -Al-O-L (b)

(Q expresses a permutation 8-quinolate ligand among a formula, O-L is a phenolate ligand and L expresses the hydrocarbon group of the carbon numbers 6-24 containing a phenyl part)

(Q)2 -Al-O-Al-(Q)2 (c)

(Q expresses a permutation 8-quinolate ligand among a formula)

[0053] As an example of a luminescent organometallic complex, for example Tris (8-quinolate) aluminum, Tris (4-methyl-8-quinolate) aluminum, tris (5-methyl-8-quinolate) aluminum, Tris (3, 4-dimethyl-8-quinolate) aluminum, tris (4, 5-dimethyl-8-quinolate) aluminum, Tris (4, 6-dimethyl-8-quinolate) aluminum, screw (2-methyl-8-quinolate) (phenolate) aluminum, Screw (2-methyl-8-quinolate) (2-methyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (3-methyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (4-methyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2-phenyl phenolate) aluminum, screw (2-methyl-8-quinolate) (3-phenyl phenolate) aluminum, [0054] Screw (2-methyl-8-quinolate) (4-phenyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2, 3-dimethyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2, 6-dimethyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (3, 4-dimethyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (3, 5-dimethyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (3, 5-G tert-butyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2, 6-diphenyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2, 4, 6-triphenyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2, 4, 6-trimethyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2, 4, 5, 6-tetramethyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (1-naphth RATO) aluminum, Screw (2-methyl-8-quinolate) (2-naphth RATO) aluminum, Screw (2, 4-dimethyl-8-quinolate) (2-phenyl phenolate) aluminum, Screw (2, 4-dimethyl-8-quinolate) (3-phenyl phenolate) aluminum, Screw (2, 4-dimethyl-8-quinolate) (4-phenyl phenolate) aluminum, Screw (2, 4-dimethyl-8-quinolate) (3, 5-dimethyl phenolate) aluminum, screw (2, 4-dimethyl-8-quinolate) (3, 5-G tert-butyl phenolate) aluminum, [0055] Screw (2-methyl-8-quinolate) aluminum-mu-oxo--screw (2-methyl-8-quinolate) aluminum, Screw (2, 4-dimethyl-8-quinolate) aluminum-mu-oxo--screw (2, 4-dimethyl-8-quinolate) aluminum, Screw (2-methyl-4-ethyl-8-

quinolate) aluminum-mu-oxo--screw (2-methyl-4-ethyl-8-quinolate) aluminum, Screw (2-methyl-4-methoxy-8-quinolate) aluminum-mu-oxo--screw (2-methyl-4-methoxy-8-quinolate) aluminum, Screw (2-methyl-5-cyano-8-quinolate) aluminum-mu-oxo--screw (2-methyl-5-cyano-8-quinolate) aluminum, Screw (2-methyl-5-trifluoromethyl-8-quinolate) aluminum-mu-oxo--screw (2-methyl-5-trifluoromethyl-8-quinolate) aluminum etc. can be mentioned. Of course, a luminescent organometallic complex may be used independently or may be used together. [two or more]

[0056] The electron injection transporting bed 5 is a layer containing the compound which has the function to convey the electron which makes impregnation of the electron from cathode easy, and which was functioned and poured in. the compound (for example, an organometallic complex -- [-- for example) which has the compound and/or other electron injection transport functions in which an electron injection transporting bed is expressed with a general formula (1) Tris (8-quinolate) aluminum and screw (10-benzo [h] quinolate) beryllium], An OKISA diazole derivative, a triazole derivative, a triazine derivative, a perylene derivative, a quinoline derivative, a quinoxaline derivative, a diphenyl quinone derivative, and nitration full -- me -- non, at least one sort can be formed using a derivative, a thiopyran dioxide derivative, etc. In the organic electroluminescence devices of this invention, it is desirable to contain the compound expressed with a general formula (1) to an electron injection transporting bed. When using together the compound expressed with a general formula (1), and the compound which has other electron injection transport functions, the rate of a compound of being expressed with the general formula (1) occupied in an electron injection transporting bed is especially prepared to about 0.5 - 20% of the weight preferably about 0.2 to 30% of the weight still more preferably about 0.1 to 40% of the weight more preferably 0.1% of the weight or more. In this invention, it is desirable to use together the compound and organometallic complex [for example, the compound expressed with said general formula (a) - a general formula (c)] which are expressed with a general formula (1), and to form an electron injection transporting bed.

[0057] As cathode 6, it is desirable to use a metal with a comparatively small work function, an alloy, or an electric conductivity compound as electrode material. As electrode material used for cathode, a lithium and lithium-indium alloy, sodium, and sodium-potassium alloy, calcium, magnesium, and magnesium-silver alloy, a magnesium-indium alloy, an indium, a ruthenium, titanium, manganese, an yttrium, aluminum, an aluminium-lithium alloy, an aluminum-calcium alloy, an aluminum magnesium alloy, a graphite thin film, etc. can be mentioned, for example. Such electrode material may be used independently or may be used together. [two or more]

[0058] Cathode can form such electrode material on an electron injection transporting bed by approaches, such as vacuum deposition, the sputtering method, ionization vacuum deposition, the ion plating method, and the ionized cluster beam method. Moreover, cathode may be structure much more or may be multilayer structure. In addition, as for the sheet electric resistance of cathode, it is desirable to set to below hundreds of ohms / **. Although the thickness of cathode is based also on the ingredient of the electrode material to be used, generally it is more preferably set as about 10-500nm about 5-1000nm. In addition, in order to take out luminescence of organic electroluminescence devices efficiently, it is desirable to be transparence thru/or that one [at least] electrode of an anode plate or cathode is translucent, and it is more desirable to set up the ingredient of an anode plate and thickness generally, so that the permeability of luminescence light may become 70% or more.

[0059] moreover, the organic electroluminescence devices of this invention -- setting -- the -- the singlet oxygen quencher may contain in inside further at least. Especially as a singlet oxygen quencher, it does not limit, and rubrene, a nickel complex, diphenyl iso benzofuran, etc. are mentioned, for example, it is rubrene especially preferably. Especially as a layer which the singlet oxygen quencher contains, although it does not limit, it is a luminous layer or a hole-injection transporting bed, and is a hole-injection transporting bed more preferably. In addition, for example, when making a hole-injection transporting bed contain a singlet oxygen quencher, homogeneity may be made to contain in a hole-injection transporting bed, and you may make it contain near the layer (for example, a luminous layer, the electron injection transporting bed which has a luminescence function) which adjoins a hole-injection transporting bed. 0.01- of the amount of whole which constitutes the layer (for example, hole-injection transporting bed) to contain as a content of a singlet oxygen quencher -- it is 0.1 - 20 % of the weight more preferably 0.05 to 30% of the weight 50% of the weight.

[0060] Especially concerning the formation approach of a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, it cannot limit and can produce by forming a thin film by vacuum evaporation technique, ionization vacuum deposition, and the solution applying methods (for example, a spin coat method, the cast method, a dip coating method, the bar coat method, the roll coat method, a Langmuir-Blodgett method, etc.) for example. Although especially the conditions of vacuum deposition are not limited when forming each class with a vacuum deposition method, it is 0.005 - 50 nm/sec under the vacuum below 10-5Torr extent at the boat temperature (source temperature of vacuum evaporationo) of about 50-400 degrees C, and the substrate temperature of about -50-300 degrees C. It is desirable to carry out with the evaporation rate of extent. In this case, each class, such as a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, can manufacture the organic electroluminescence devices which were further excellent in many properties by forming continuously under a vacuum. When forming each class, such as a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, with a vacuum deposition method using two or more compounds, it is desirable that carry out temperature control of each boat into which the compound was put, and it carries out vapor codeposition according to an individual.

[0061] By the solution applying method, when you form each class, a solvent is dissolved or distributed and let the component which forms each class, its component, binder resin, etc. be coating liquid. As binder resin which can be used for each class of a hole-injection transporting bed, a luminous layer, and an electron injection

transporting bed For example, Polly N-vinylcarbazole, polyarylate, polystyrene, Polyester, a polysiloxane, polymethyl acrylate, polymethylmethacrylate, A polyether, a polycarbonate, a polyamide, polyimide, polyamidoimide, Poly paraxylene, polyethylene, polyphenylene oxide, polyether sulfone, High molecular compounds, such as the poly aniline and its derivative, the poly thiophene and its derivative, polyphenylene vinylene and its derivative, the poly fluorene and its derivative, poly thienylene vinylene, and its derivative, are mentioned. Binder resin may be used independently or may be used together. [two or more]

[0062] When forming each class by the solution applying method, the component which forms each class, its component, binder resin, etc. a suitable organic solvent (for example, a hexane, an octane, Deccan, and toluene --) Hydrocarbon system solvents, such as a xylene, ethylbenzene, and 1-methylnaphthalene, For example, an acetone, a methyl ethyl ketone, methyl isobutyl ketone, Ketone system solvents, for example, dichloromethane, such as a cyclohexanone, chloroform, Tetrachloromethane, a dichloroethane, trichloroethane, tetrachloroethane, Halogenated hydrocarbon system solvents, such as a chlorobenzene, a dichlorobenzene, and chloro toluene, For example, ester system solvents, such as ethyl acetate, butyl acetate, and amyl acetate, For example, a methanol, propanol, a butanol, a pentanol, a hexanol, Alcoholic system solvents, such as a cyclohexanol, methyl cellosolve, ethylcellosolve, and ethylene glycol, For example, ether system solvents, such as dibutyl ether, a tetrahydrofuran, dioxane, and an anisole, For example, N.N-dimethylformamide, N,N-dimethylacetamide, A polar solvent and/or water, such as a 1-methyl-2-pyrrolidone, 1,3-dimethyl-2-imidazolidinone, and dimethyl sulfoxide, can be dissolved or distributed, it can consider as coating liquid, and a thin film can be formed by various kinds of applying methods.

[0063] In addition, especially as an approach of distributing, although it does not limit, it can distribute in the shape of a particle using a ball mill, a sand mill, a paint shaker, attritor, a homogenizer, etc., for example. It cannot limit, can be set as the density range suitable for producing desired thickness by the applying method to enforce, especially concerning the concentration of coating liquid, and, generally is about 1 - 30% of the weight of solution concentration preferably about 0.1 to 50% of the weight. In addition, although it does not limit especially concerning the amount used when using binder resin, generally it sets up to about 15 - 90% of the weight more preferably about 10 to 99% of the weight about 5 to 99.9% of the weight to the component which forms each class (receiving the total amount of each component, in forming the component of a mold further).

[0064] Although it does not limit especially concerning the thickness of a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, generally it is desirable to set it as 5nm - about 5 micrometers. In addition, to the produced component, a protective layer (closure layer) can be prepared, and a component can be enclosed into inactive substances, such as paraffin, a liquid paraffin, a silicone oil, a fluorocarbon oil, and a zeolite content fluorocarbon oil, and can be protected in order to prevent contact with oxygen, moisture, etc. As an ingredient used for a protective layer, for example Organic polymeric materials for example, fluorination resin, an epoxy resin, silicone resin, and epoxy silicone resin --

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TECHNICAL FIELD

[Field of the Invention] This invention relates to organic electroluminescence devices.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] Conventionally, although inorganic electroluminescence devices have been used as the panel mold light sources, such as a back light, in order to make this light emitting device drive, the high tension of an alternating current is required for them. Recently came and the organic electroluminescence devices (an organic electroluminescent element: organic EL device) which used the organic material for luminescent material were developed [Appl.Phys.Lett., 51, and 913 (1987)]. Organic electroluminescence devices are components which emit light using the light which has the structure pinched between an anode plate and cathode in the thin film containing a fluorescence organic compound, injects an electron and an electron hole (hole) into this thin film, and is emitted in case an exciton (exciton) is made to generate and this exciton deactivates by making it recombine. organic electroluminescence devices -- severalV- dozens -- it is the low battery of about V direct current, and luminescence of various colors (for example, red, blue, green) is possible by being able to emit light and choosing the class of fluorescence organic compound. As for the organic electroluminescence devices which have such a description, the application to various light emitting devices, a display device, etc. is expected. However, generally, luminescence brightness is low and is not enough practically.

[0003] As an approach of raising luminescence brightness, the organic electroluminescence devices which used for example, tris (8-quinolate) aluminum as a luminous layer, and used the host compound, the coumarin derivative, and the pyran derivative as a guest compound (dopant) are proposed [J.Appl.Phys., 65, and 3610 (1989)]. Moreover, organic electroluminescence devices were using tris (8-quinolate) aluminum as a luminous layer, and using the host compound and the Quinacridone derivative (for example, Quinacridone) as a guest compound are proposed (JP,3-255190,A). Moreover, organic electroluminescence devices were using tris (8-quinolate) aluminum as a luminous layer, and using a host compound, 5, and 12-dimethyl Quinacridone (N and N'-dimethyl Quinacridone) as a guest compound are proposed [Appl.Phys.Lett., 70, and 1665 (1997)]. However, these light emitting devices are also hard to be referred to as having sufficient luminescence brightness. Moreover, the adhesion of the layer and electrode (for example, cathode) containing Quinacridone and 5, and 12-dimethyl Quinacridone was scarce, and it became clear that the it was improved on the occasion of the prolonged activity. In current, organic electroluminescence devices which emit light in high brightness further are desired.

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EFFECT OF THE INVENTION

[Effect of the Invention] It became possible to offer organic electroluminescence devices excellent in luminescence brightness by this invention.

[Translation done.]

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